

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2016/2017

DCS5038 – PROGRAM DESIGN
(IT Students Only)

13 OCTOBER 2016
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS:

1. This question paper consists of 7 pages with 5 questions.
2. **SECTION A:** Answer **ALL** questions.
3. **SECTION B:** Answer **ONLY ONE** (1) question.
4. Please print all your answers in the Answer Booklet provided

SECTION A: STRUCTURED QUESTIONS (75 MARKS)

Instruction: Answer all the questions in this section and write your answers in the answer booklet provided.

Question 1 (25 marks)

A local hypermarket provides parking area for its customers. For those customers who are members, the parking rate per hour is RM0.50. For the customers who are not members, the parking rate is based on the amount of hours the vehicle was parked.

Membership Status	Parking Hour	Parking Rate
Member	Rate per hour	RM 0.50
	Less than 2 hours	RM 0.50
	2 to 4 hours	RM 1.00
	More than 4 hours	RM 2.00

The parking system will need membership status and parked hours as input. The output will be membership status, parked hours, parked rate and payment.

- Based on the description given above, write the complete pseudocode. [12 marks]
- Convert the pseudocode in (a) into a flowchart. [13 marks]

Question 2 (25 marks)

- Write only the *switch case* statement in C to represent the following table information. Set the plan name, data and free calls variables with the correct information. The plan name, data and calls are identified based on the plan code. [8 marks]

Plan Code	A	B or b	C
Plan Name	SurfMore 30	First Basic	Smart Plan 50
Data (GB)	2	4	3
Free Calls (Minutes)	30	50	60

- Spherical cap is the section of a sphere detached by a flat surface. The total surface area of the spherical cap can be calculate with the following formula.

$$\text{Surface Area} = 2\pi(\text{circumference}^2 + 2\text{height}^2) \text{ where}$$

$$\text{Circumference} = 2\sqrt{\text{height}(2\text{radius} - \text{height})}$$

- Create a function called *get_circumference(...)* which takes in 2 parameters which are *height* and *radius*. This function returns the value of *circumference*.
 - Create another function called *get_surface_area(...)*. This function takes in 2 parameters which are *circumference* and *height*. This function returns the *surface area* of the spherical cap.
 - Write how each function will be called in the *main()* function to display the spherical cap surface area.
 - Use the built-in functions available in *math.h* header file to write the formulas.
- [7 marks]

Continued...

c) What will be displayed when the following codes are executed successfully?

[10 marks]

```
i.  int i = 7, j;

    while (i > 3)
    {
        for(j = 3; j <= i; j += 2)
            printf("%d\n", i + j);
        i=i-2;
    }

    printf("%d    %d\n", i, j);

ii. int a=10, b=7, x=2, y=4, p, q, r, s;

    printf("\n%d", a-- / (++b - x) * y);
    printf("\n%d", b + --y * a--);
    printf("\n%d", x * y / ++a);
    printf("\n%d", a + b - x * y);
```

Question 3 (25 marks)

a) To find the total resistance in a parallel circuit, the following formula can be used.

[9 marks]

$$\text{Total Resistance, } R_T = \frac{1}{\frac{1}{R_T}}$$

$$\text{Where, } \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$$

Assume that the table below shows 3 circuits with various amount of resistors. Circuit 1 has 3 resistors. Circuit 2 has 5 resistors and Circuit 3 has only 2 resistors. Write a program to calculate each circuit's total resistance.

	Resistor 1	Resistor 2	Resistor 3	Resistor 4	Resistor 5
Circuit 1	200	470	220		
Circuit 2	120	99	150	350	290
Circuit 3	109	88			

[Requires the use of a 2 dimensional array. Use a do while loop to repeat the circuits and a for loop to sum the resistance for each circuit.]

SAMPLE OUTPUT

```
Circuit 1
Total Resistance : 85.667 ohm
```

Continued...

```
Circuit 2
Total Resistance : 31.841 ohm

Circuit 3
Total Resistance : 48.690 ohm
```

- b) Write the code segments based on the given descriptions.
- Declare a file pointer called *input*. Open a file called *location.txt* for reading using this pointer. [2 marks]
 - If the file is not available, display "*File does not exist.*". [2 marks]
 - The content of the text file *location.txt* is as shown below. It includes the *location*, *latitude* and *longitude* values. [7 marks]

FILE <i>location.txt</i> CONTENTS
UTM 1.5523763 103.63322
KLCC 3.153889 101.71333
UM 3.1185 101.665
UMS 6.0367 116.1186
UNIMAS 1.465174 110.4270601

Ask the user to enter a location. Check if the user's location can be found in the text file. If found, display the *location*, *latitude* and *longitude* as shown below.

SAMPLE OUTPUT
Enter a location : KLCC
Location : KLCC
Latitude : 3.153889
Longitude : 101.713333

Otherwise display "*Sorry, location could not be found.*".

SAMPLE OUTPUT
Enter a location : MMU
Sorry, location could not be found

- c) Declare a nested structure called *Density* which has *mass* as a member. This structure has another structure within it called *Volume* with 3 members which are *height*, *width* and *length*. [5 marks]

Continued...

SECTION B: STRUCTURED QUESTIONS (25 Marks)

Instruction: Choose and answer **ONLY ONE (1)** question from this section and write your answers in the answer booklet provided.

Question 1

A hotel wants to install ventilation fans for its rooms. The type of fan used for each room differs based on the number of cubic feet of air they move per minute (CFM). Each type of room will have its own standard amount of air changes. You are required to write a complete program to calculate the required CFM and the cost of purchasing the ventilation fans based on the CFM.

- In *main()*:
 - Create a file pointer called *input*.
 - Use this pointer to open a file called *room.txt* for reading. If the file could not be found, display a message "File does not exist."
 - If the file exists:
 - Read the content of the file, which are *room type*, *length*, *width* and *height* of the room.

Content of <i>room.txt</i> file				
Bedroom	11.5	10	12	
Bathroom	7	6	12	
Kitchen	13	21.5	13	
Dining	24	16	13.9	
Basement	13.5	15	12	

- Call function *get_air_change(...)* and pass *room type* as argument.
 - Next, calculate the *volume* of the room.
[*volume = length x width x height*]
 - Call function *get_CFM(...)* and pass *volume* and *amount of air changes* as argument.
 - Call function *get_fan_cost(...)* and pass *CFM value* as argument.
 - Display individual *room type*, *CFM value* and *cost of fan* on the screen.
 - Display the overall cost of buying fans for all rooms.
- In function *get_air_change(...)*:
 - Using *if else* statements, identify the amount of air change required based on the *room types*.
 - Use the table in the next page as your reference.

Room Type	Number of air changes
Bathroom	6
Kitchen	9
Bedroom	8
Other types of rooms	5

- Return the *number of air changes*.
- In function *get_CFM(...)*:
 - Calculate and return the *CFM value* using the formula

$$CFM = \frac{\text{volume} \times \text{number of air change}}{60}$$
- In function *get_fan_cost(...)*:
 - Using *if else* statements, identify the *cost of the fan* based on the *CFM value*.
 - Use the table below as your reference.

CFM value	Cost of fan
Less than 125	RM 56.00
125 to less than 250	RM 105.00
250 to less than 500	RM 155.90
500 or more	RM 210.50

- Return the *cost of fan*.

SAMPLE OUTPUT

```

Room Type   : Bedroom
CFM         : 184.00
Fan Cost    : RM 105.00

Room Type   : Bathroom
CFM         : 50.40
Fan Cost    : RM 56.00

Room Type   : Kitchen
CFM         : 545.03
Fan Cost    : RM 210.50

Room Type   : Dining
CFM         : 444.80
Fan Cost    : RM 155.90

Room Type   : Basement
CFM         : 202.50
Fan Cost    : RM 105.00

Total fan cost : RM 632.40

```

Continued...

Question 2

A small startup company is interested in purchasing a system that can be used to assess their employees' performances. Write a complete C program for this purpose.

- Create a structure called *COMPANY*.
 - The members are *employee id* of type character, an array called *points* with 4 elements, *average points* and finally *status* of assessment which is of type character string
- In *main()* function:
 - Create a structure variable array called *Employee* with 6 elements which represents 6 employees in the company.
 - Using a *do while* loop:
 - Ask the user to enter the *employee id*.
 - Using a *for* loop:
 - Ask the user to enter 4 assessment *points*. Points are in the range of 1 to 5.
 - Calculate the total points.
 - Calculate the *average points* for each employee.
 - Call function *get_status(...)* and pass the *average points* as argument.
 - Call function *display_report(...)* and pass structure variable *Employee* as argument.
- In *get_status()* function:
 - Use *if else* statements to identify the assessment *status* of an employee based on the *average points*. Use the table below as a guide.

Average Points	Assessment Status
Less than 1	Poor
1 to less than 2	Unsatisfactory
2 to less than 3	Satisfactory
3 to less than 4	Very Satisfactory
4 to 5	Outstanding

 - Return the *status*.
- In *display_report()* function:
 - Use a *for* loop to identify how many employees are in the Poor and Unsatisfactory level.
 - The sample output is shown in the next page.
- You are required to write the function prototypes for this program.

Continued...

SAMPLE OUTPUT

```
Enter Employee ID : 1011
Enter Quarter 1 points : 0.78
Enter Quarter 2 points : 1
Enter Quarter 3 points : 0.50
Enter Quarter 4 points : 1.15

Enter Employee ID : 2133
Enter Quarter 1 points : 4.75
Enter Quarter 2 points : 4.5
Enter Quarter 3 points : 4.9
Enter Quarter 4 points : 4.35

Enter Employee ID : 1175
Enter Quarter 1 points : 1.21
Enter Quarter 2 points : 0.65
Enter Quarter 3 points : 0.5
Enter Quarter 4 points : 1.09

Enter Employee ID : 2004
Enter Quarter 1 points : 2.1
Enter Quarter 2 points : 1.9
Enter Quarter 3 points : 1.8
Enter Quarter 4 points : 2

Enter Employee ID : 4535
Enter Quarter 1 points : 3.75
Enter Quarter 2 points : 3.44
Enter Quarter 3 points : 2.1
Enter Quarter 4 points : 1.5

Enter Employee ID : 3109
Enter Quarter 1 points : 4
Enter Quarter 2 points : 4.5
Enter Quarter 3 points : 4.3
Enter Quarter 4 points : 4

Poor rating          : 2
Unsatisfactory rating : 1
```

End of Page.